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POLICY PAPER

How Are Irish Households Coping with their Mortgage Repayments? Information from the *Survey on Income and Living Conditions**

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Abstract: This paper uses information contained within the *Survey on Income and Living Conditions (SILC)* to examine the ability of Irish households to sustain their mortgage repayments. We calculate mortgage repayment to income (MRTI) ratios for a representative sample of Irish households and examine the distribution of this ratio across the sample. In particular, we stratify information on marital, work and educational status along with household composition according to this MRTI. We also examine the distribution of information on household mortgages such as the source, the interest rate paid, the age and tenure, and the monthly repayment of the mortgage according to the same ratio. Finally, the distributional implications for the MRTI of a significant unemployment and interest rate shock are also examined.

I INTRODUCTION

Amongst the many countries presently dealing with the aftermath of a substantial property boom, the Irish case is of particular note. Out of a sample of 18 OECD countries between 1995 and 2007, average annual

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increases in nominal Irish house prices, at 15 per cent, were the largest by a full 5 percentage points. Conversely since 2007 quarter 1, annual falls in the equivalent price series for Ireland are considerably larger than that of the country experiencing the next most significant decline. This rapid turnaround in house prices over a relatively short period of time, coupled with the significant volume of mortgages taken out by a young population during a period of heightened price levels, raises a number of worrying macroeconomic issues.

Until recently, most of the attention associated with the decline in fortunes of the housing sector has naturally focused on the distress experienced by the Irish financial system. This resulted in the by now well known Irish government guarantee of the entire banking system in September 2008. However, a related issue, also with considerable financial stability implications, is the growing levels of financial distress experienced by Irish mortgage holders.[1] Over the period 2004-2006, when house prices were at their peak, almost 340,000 mortgages were approved. This was in a period when the Irish economy was experiencing significant improvements in living standards and hence the general ability within the economy to sustain such mortgages was quite high. However, the severe decline in the performance of the Irish property sector allied to the post-2007 global economic downturn has had a distinctly harsh impact on the Irish economy with unemployment rates, in particular, experiencing a swift increase from 4.5 per cent in mid-2006 to over 12 per cent in mid-2009. This would suggest that many Irish households are presently, or will soon, experience difficulties with their mortgage repayments.

In this paper we use information from the Irish component of the EU-wide *Survey on Income and Living Conditions* (*SILC*) to examine the financial sustainability of mortgage repayments amongst Irish households. The *SILC*, which is nationally representative, is conducted to obtain information on income and living conditions of different types of households.[2] Within the survey there are approximately 60 questions relating to housing. These range from questions concerning the type of dwelling households live in to the original size of a households' mortgage, monthly repayment levels, the actual duration of the mortgage and a question on mortgage repayment arrears. Clearly this information, when combined with other data collected in the survey, such as household disposable income, can provide a telling cross-sectional account of the burden of mortgage repayments within Irish society.

[1] In response to growing evidence of financial distress among mortgaged households, the Irish government established the Mortgage Arrears and Personal Debt Expert Group in February 2010. This group was charged with making recommendations on means to alleviate financial distress for households with mortgage arrears on their principal private residence.

[2] For more on the *SILC* see http://www.cso.ie/eusilc/statistics.htm.

In particular, our primary variable of interest will be the mortgage repayment to income ratio (MRTI) of Irish households, which measures the cost of mortgage payment (including principal and interest) as a share of income.

In light of the sharp increase in both price levels and activity in the Irish housing market, it is not surprising that this aspect of the housing market has been the subject of extensive research. A non-exhaustive list of papers includes Murphy (1998); Kenny (1999); Conniffe and Duffy (1999); Roche (1999, 2001 and 2003); McQuinn (2004); Duffy, Fitz Gerald and Kearney (2005); Fitzpatrick and McQuinn (2007); McQuinn and O'Reilly (2007 and 2008); Addison-Smyth, McQuinn and O'Reilly (2009a and b) and Addison-Smyth and McQuinn (2009). Nearly all of this empirical work, which typically involves estimating reduced form house price models, is conducted at an aggregate level using time-series of data from the early 1980s onwards. However, the stark downturn both in the performance of the housing market and in the general economy highlights the need for a greater understanding of individual mortgage holders' financial health and the sensitivity of households' affordability levels to significant changes in macroeconomic conditions. In this regard, there has been a relative dearth of micro-level analyses examining the implications of developments in the Irish housing market on individual households. We believe that this study goes some way towards addressing this gap.

Detailed micro-level information on mortgages held by households are essential to understanding the scale of potential mortgage arrears and default amongst homeowners, and consequently the success of any public policies aimed at alleviating mortgage repayment stress such as the Home Affordable Modification Program (HAMP) launched in the United States.[3] In recent times, there has been a noticeable increase in micro-level studies of the housing market, particularly in the US, from this prospective. Examples of such studies include Haughwout, Okah and Tracy (2009), Cordell, Dynan, Lehnert, Liang and Mauskopf (2009), Amromin and Paulson (2009) and Mian and Sufi (2009).

In the next section we commence by examining aggregate indicators of performance of the Irish housing market. We then provide an introduction to the *SILC* in terms of the information contained within the survey on the housing market. In a subsequent section, we explore the burden of mortgage repayments by focusing, in particular, on the mortgage repayment to income (MRTI) ratio. We stratify information within the survey according to the distribution of this ratio across households and estimate a regression model which provides a summary of the different impacts on this ratio. To analyse

[3] This was one of the first acts of the new Obama administration in early 2009.

the sensitivity of the ratio to macroeconomic conditions, we conduct two scenarios. In an unemployment scenario, we attempt to approximate recent trends in unemployment and its impact on the MRTI, while in an interest rate scenario, we examine the implications for households' affordability of changes in variable interest rates. A final section concludes.

II AGGREGATE HOUSING INDICATORS

In Figure 1, annual rates of growth in real Irish house prices and GDP are plotted. What is evident, initially, is the relatively high rate of correlation between both series over the sample in question (1984-2009) at 71 per cent. This is to be expected as many models of house prices assume a long-run relationship between price levels and fundamental variables in the economy such as income or output levels. The surge both in house prices and GDP growth post-1995 is also very obvious, with house price increases reaching a maximum of 30 per cent between quarter 1 1997 and the corresponding quarter in 1998. Between 1995 and 2007, the average annual real rate of growth in prices was a considerable 9 per cent. GDP growth for the same period averaged 7.6 per cent. The only comparable period of growth in the Irish housing market before this was in the late 1980s when prices experienced average increases of 7 per cent between 1988 and 1990. In the middle of the "Celtic Tiger" boom, there was a period of 3 consecutive quarters negative price growth from the final quarter of 2001 to the third quarter of 2002. This downturn is often attributed to two factors – the general downturn in world economic activity following the terrorist attacks in New York in the third quarter of 2001 and the introduction, in the Autumn of 2000, of certain fiscal measures, advocated in the Bacon report, specifically targeting investors in the Irish property market.[4] These measures were subsequently withdrawn a year later. Price growth remained consistently strong thereafter until the second quarter of 2007.

What is interesting to observe during this period is the aggregate mortgage repayment burden. In Figure 2 we calculate the real average monthly mortgage repayment level over the period 1983 to 2009. This is carried out in the following manner: we first take the price of a new house for the period and assume that a typical mortgage is offered at 90 per cent of this

[4] The Bacon report was commissioned by the Irish Department of the Environment, Heritage and Local Government. The report presented certain measures primarily aimed at alleviating the demand side pressures in the housing market. See Bacon *et al.* (1998) and Bacon and MacCabe (1999 and 2000) for details.

Figure 1: *Year-on-Year Changes in (Real) House Prices and GDP 1984:1-2009:1*

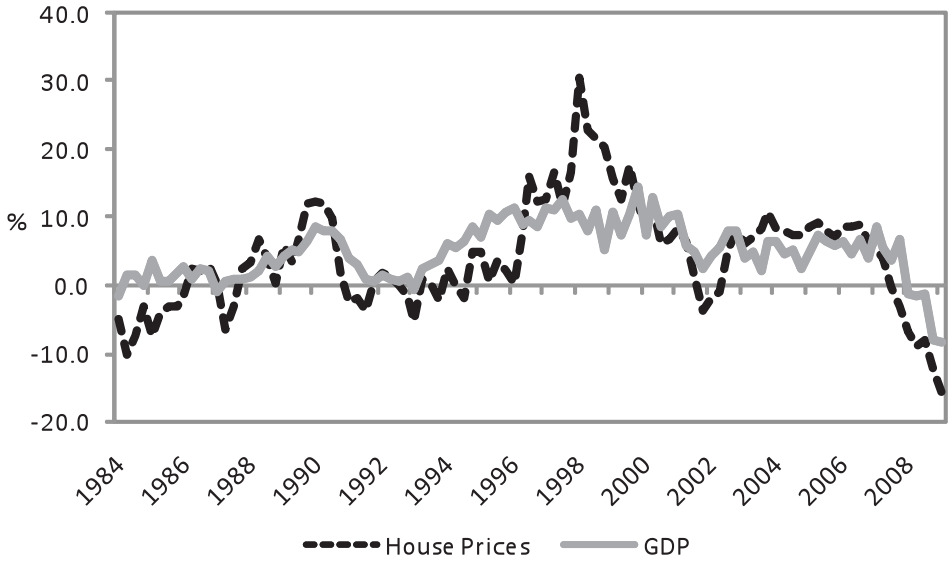
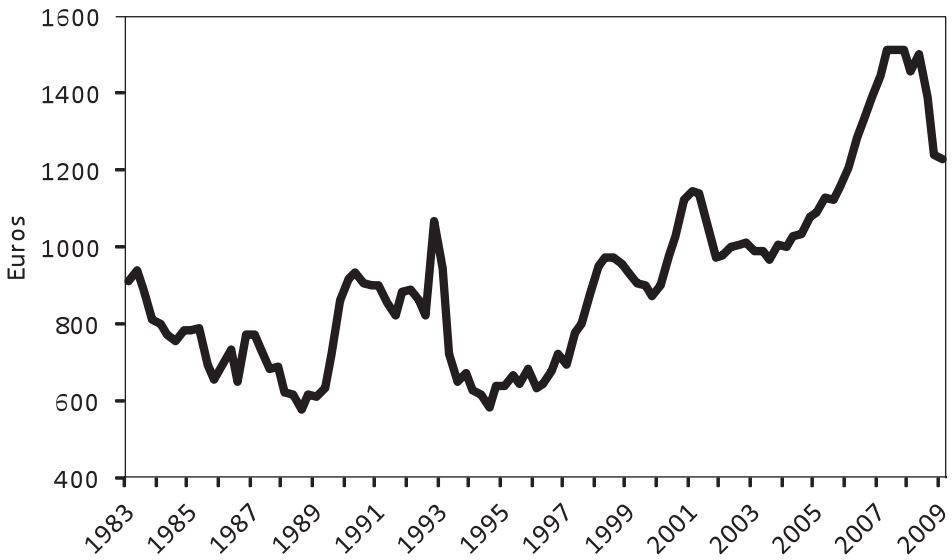


Figure 2: *Average Monthly Mortgage Repayments (Real) 1983:1-2009:1*



price.[5] We then take the given mortgage interest rate for the period and using a simple annuity formula, we can calculate the average monthly mortgage repayment.[6] While the amount began to escalate quite substantially from 1995 onwards, it did not exceed the previous sample high in the early 1990s until the end of 2004. From then onwards, households were clearly facing historically high mortgage repayments.

At an aggregate level how did this level of repayment compare with the growth in Irish disposable incomes? Post-1995, the Irish economy recorded substantial increases in national income resulting in greater affordability levels within the economy. In Figure 3, two series are plotted. We calculate a ratio of the mortgage repayments in Figure 2 to total aggregate household disposable income.[7] This ratio can be read from the left hand side axis, while the relevant mortgage interest rate can be observed from the right hand side. Again it is interesting to note that this ratio was somewhat below historical levels for much of the house price boom associated with the *Celtic Tiger*. In the early 1990s, this ratio approached 40 per cent but it was not until 2006 that the ratio went above 30 per cent again, suggesting that households were, on aggregate, coping with the historically high mortgage levels being drawn down. It is worth noting, however, that the reason for the high ratios in the early 1990s is due to the particularly high mortgage interest rates at that time, while it is clear that the reason for the high ratios at the end of the sample is the very high level of house prices underpinning the mortgage amounts. From this, it can be concluded that households that took out mortgages in recent years are particularly vulnerable to either an interest rate or an income shock.[8]

Some idea of the full extent of this exposure can be seen in Figure 4, where the total annual number of mortgages approved is plotted. This series rose consistently from the mid-1990s and reached a peak in 2005 with over 120,000 mortgages being extended. To get some idea of how this relates to total population levels, we also plot the ratio of this mortgage volume to the total number of people in the 25 to 44 year age group – the group regarded as being the prime house purchasing cohort. The ratio mirrors the total volume figure very closely, with the proportion obtaining a mortgage rising from 4 per cent of this cohort earlier in the sample to over 9 per cent by 2005.

[5] This ignores the issue of greater provision of credit levels by Irish financial institutions over the period. One way in which greater credit levels were extended was through increasing the typical loan to value ratios.

[6] See McQuinn and O'Reilly (2008) for more on this.

[7] Further information on how this variable is calculated is available in McQuinn and O'Reilly (2008).

[8] Overall, from both the household and bank's perspectives, the full implications of high mortgage repayment distress levels and subsequent defaults are a function of the level of positive/negative equity held in the property by the household.

Figure 3: *Mortgage Repayment Burden and Mortgage Interest Rates 1983:1-2009:1*

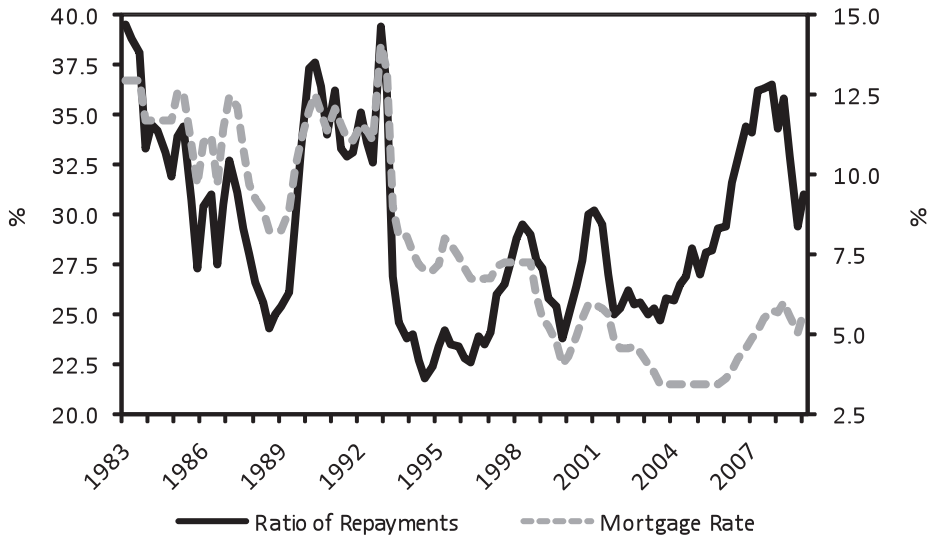
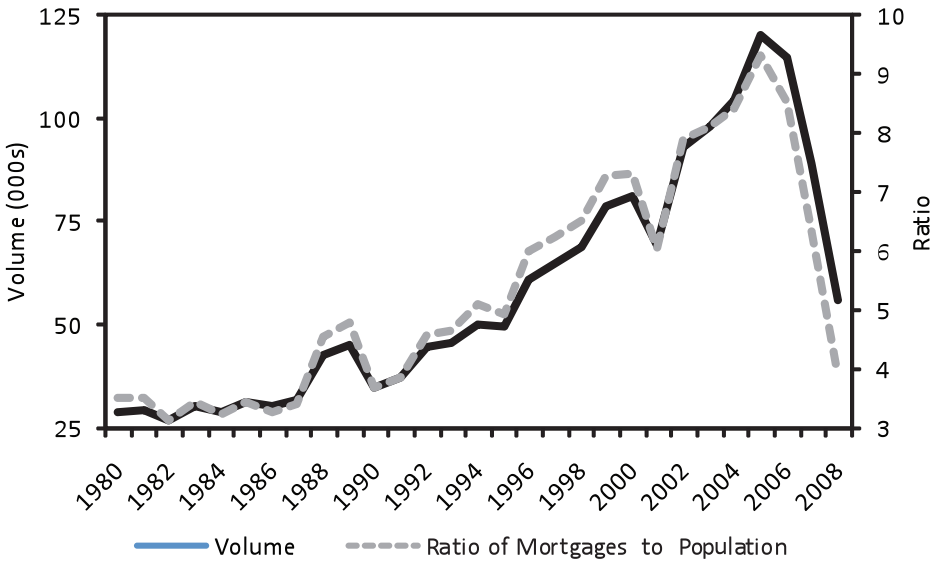


Figure 4: *Number of Mortgages Approved 1980-2008*

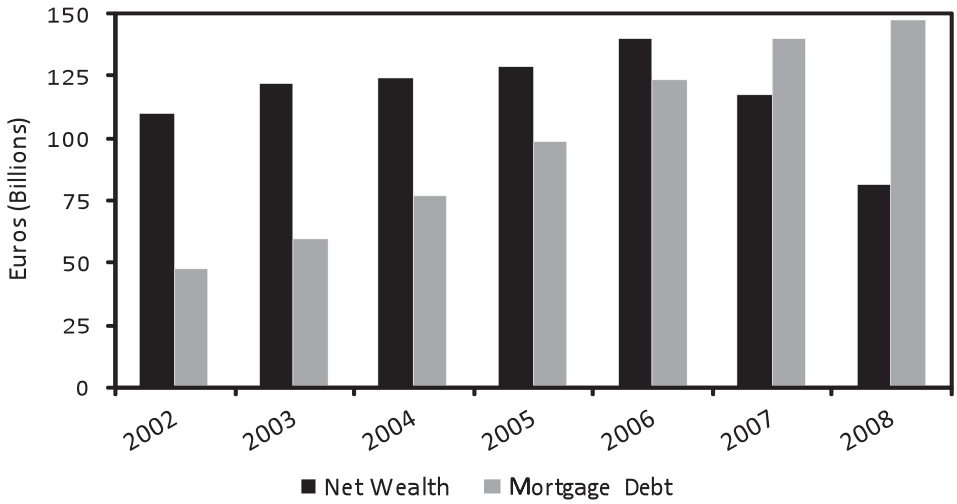


Finally, from an aggregate perspective, the overall capacity of the economy to service the increased levels of mortgage debt can be gauged from Figure 5. In this figure, the total level of household net financial wealth[9] in the economy versus the total stock of mortgage debt is plotted over the period 2002 to 2008. Household net financial wealth can be defined as the excess of households' holdings of deposits, shares, life insurance and pensions fund assets over their liabilities, which are mainly loans.[10] From 2002, the scale of mortgage indebtedness grew considerably relative to net wealth levels with total mortgage levels in both 2007 and 2008 exceeding total household net financial wealth.[11] In 2008, the difference was a considerable €66 billion.

2.1 *Deterioration in Irish Macroeconomic Conditions*

While nearly all western economies have been affected by the international downturn prompted by the financial crisis of 2008, the Irish economy, since 2007, has experienced a particularly swift contraction. The emergence of the so-called *Celtic Tiger* in the mid-1990s led to a sustained period of economic growth in Ireland with Irish income per capita becoming

Figure 5: *Household Net Financial Wealth Versus Mortgage Debt 2002-2008*



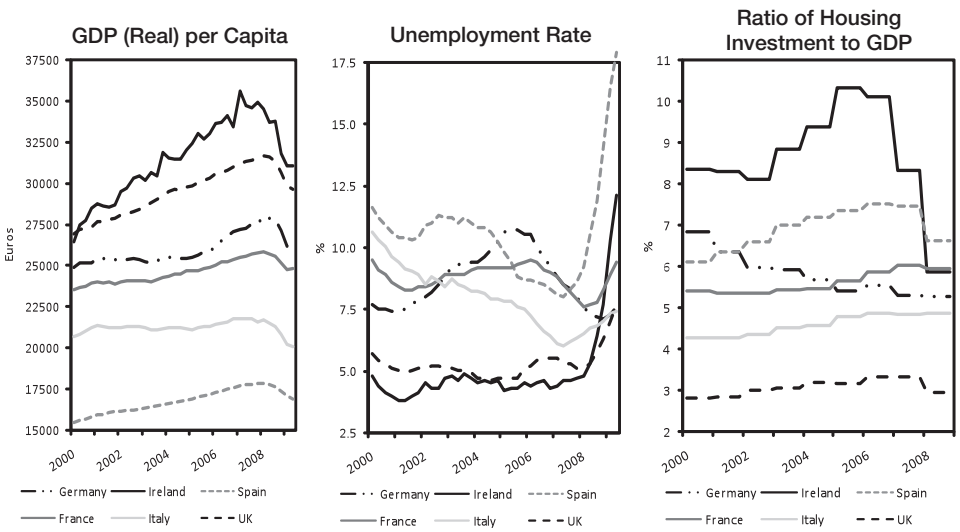
[9] This refers to the net financial position of households and non-profit institutions serving households i.e. items S14 + S15 in the CSOs Institutional Sector Accounts.

[10] In terms of total household debt to income, data from the OECD demonstrates that by 2007, the Irish household leverage ratio of 191 per cent was second only to that of Denmark for a sample of 16 countries. Furthermore, over the ten year period 1997-2007, the Irish household leverage ratio experienced the largest increase (85 per cent) of all the countries. See Glick and Lansing (2010) for more on this.

[11] Note that the net financial wealth level already nets off all mortgages.

one of the highest in the Euro Area. However, from the early part of the present decade, Irish economic activity was becoming increasingly reliant on the performance of the residential housing sector. In 2007, in a sample of 19 European countries, Ireland, with 18 completions per 1,000 population had the highest rate. The second highest was Spain with 17.6, while Finland and France with 6.7 houses were next. The UK, for example, had a completion ratio of 3.6.[12] Additionally, most assessments of the Irish housing market by 2007 concluded that house price levels were significantly above those levels sustained by economic fundamentals, with estimates of overvaluation in the housing market typically averaging in the 20 to 30 per cent range.[13] Therefore, the arrival of the international financial crisis resulted in an already cooling market coming to a shuddering halt with considerable macroeconomic implications.

Figure 6: *Select Cross-Country Macroeconomic Comparisons 2000:1-2009:2*



To provide some idea of the relative nature of the recent Irish economic slowdown, in Figure 6 we present three graphs comparing various Irish macroeconomic indicators with a select sample of European countries over the period 2000 to 2009. In the first panel, we present GDP per capita; in the second, unemployment rates and in the third, a ratio of investment in housing construction to GDP. From the income per capita graph, it is clear that Irish

[12] Available on page 64 of the Central Statistics Office (CSO) publication *Construction and Housing in Ireland*, 2008 edition.

[13] For example, estimates from the McQuinn and O'Reilly (2008) model indicated that house prices were overvalued by 35 per cent in 2007 quarter 2 – see Honohan (2010), page 83.

income levels were in excess of those across the other countries for the period. However, Irish income levels clearly started to decline before those of the other countries – from 2007 quarter 2 onwards, whereas, in all other cases, income levels only started to decline from mid-2008. Even since 2008 quarter 2, Irish income levels have fallen to a larger extent, experiencing as of mid-2009, a decline of almost 11 per cent over the previous two years. For all of the six countries, unemployment rates have risen sharply during 2008, however, for Ireland and Spain, the increase has been acutely dramatic with Ireland's unemployment rate increasing by 8 percentage points in just two years. The increase in the Spanish rate has been even more pronounced with rates going from 8.6 per cent at the end of 2007 to nearly 18 per cent in mid-2008. The final graph provides some indication of the particularly large unemployment impact in the Irish and Spanish markets. The ratio of investment in the housing sector to overall GDP levels was highest for Spain and Ireland with rates between 2005 and 2007 averaging 7.5 and 10 per cent respectively. For the other countries, this rate was approximately 5 per cent. Thus, the downturn in world trade, owing to the financial crisis, compounded the unemployment shock already being experienced in Ireland and Spain due to the unwinding of the respective property booms.

III THE SURVEY ON INCOME AND LIVING CONDITIONS

The *SILC* provides a comprehensive micro-level dataset surveying income and living conditions across different types of households. As a survey of private households, it is voluntary and is carried out under EU legislation. In Ireland, the survey is conducted on an annual basis by the Central Statistics Office and, while it is primarily concerned with indicators of poverty, deprivation and social exclusion (Central Statistics Office, 2008), the survey also contains a significant amount of information for each individual on home ownership, details of mortgage debt and income. It, therefore allows us to examine, in the case of mortgaged households, the proportion of household income that is absorbed by mortgage repayments.

Full details of the sampling methodology used for the Irish *SILC* are available in Central Statistics Office (2008) but here we set out some of the main features. The *SILC* aims to provide a nationally representative sample of households and as such adopts a two stage sample design. In the first stage, a total of 2,600 nationwide blocks (or small areas) are selected to proportionally represent eight strata reflecting population density. In the second stage, sample and substitute households are randomly selected from each block. About 130 households were surveyed each week during the twelve months of 2007, resulting in a sample of 5,608 households and 13,691

individuals. Of the 5,608 households surveyed in 2007, about 80 per cent own their own homes, while mortgaged households represent over one quarter of the total sample of households. It is important to note that the mortgage information in the *SILC* relates specifically to owner-occupied premises and does not take account, of say, investment properties.

In the next section, we focus on the sample of mortgaged households and examine the distribution of mortgage repayment burdens across different types of households.

IV BURDEN OF MORTGAGE REPAYMENTS AMONGST IRISH HOUSEHOLDS

The mortgage repayment to income (MRTI) ratio captures the share of a household's income that is committed to paying interest and principal on its mortgage debt. This measure, which provides a valuable insight into the ability of a household to service its mortgage, is commonly used by policy-makers to assess the financial health of the household sector.[14] High MRTI ratios can, for example, constrain a household's access to credit, affecting its ability to smooth consumption over time and making the household more sensitive to economic and socioeconomic shocks, (Debelle, 2004).

While the MRTI does not capture the total debt-repayment burden of a household (since it does not include the repayment burden associated with credit card debt and other loans), mortgage debt generally accounts for the bulk of household lending, and it, therefore, remains an important metric of household financial health.[15] Furthermore, while other measures can also be useful in assessing household financial health, such as household bankruptcy and delinquency rates for example, these measures can be affected by underwriting and collection practices, which can differ across time and countries. They also tend to capture the financial health of only a relatively narrow set of households. For these reasons, mortgage-repayment-to-income ratios feature prominently in studies on household financial distress (see Haughwout, Okah and Tracy, 2009 or Georgarakos, Lojschova and Ward-

[14] In his speech to the "Credit Union National Association 2004 Governmental Affairs Conference" on February 23rd 2004, the then Federal Reserve Board Chairman, Alan Greenspan alluded to the importance of using debt and mortgage repayment to income ratios to assess the financial health of US households, http://www.federalreserve.gov/boarddocs/speeches/2004/20040223/.

[15] While at the micro level the *SILC* does not collect information on the level of other debts held by households, aggregate national statistics show that in the Irish case, housing finance lending accounted for over 85 per cent of total personal sector lending in 2007.

Warmedinger, 2010, for example). In this vein, several studies show that households with high mortgage- and total-debt-repayment-to-income ratios are more likely to default on their obligations when they suffer income shocks associated with job loss or illness (Whitley, Windram and Cox, 2004 or Brookes, Dicks and Pradhan, 1994 for example).

In this study, we focus on the MRTI ratio of Irish households in order to establish how heavily burdened Irish households are by their mortgage repayments. Furthermore, we examine the mortgage and household characteristics of mortgaged households in order to identify whether there are key differences between the types of households that are heavily burdened by mortgage repayments and those that are not. Such an exercise can provide useful insights for policymakers engaged in identifying targeted measures to alleviate mortgage repayment stress.

In calculating the MRTI ratio of households in our sample, we focus on those households that purchased their home either with a mortgage or under a tenant purchase scheme, and set the ratio equal to annual mortgage repayments (capital plus interest payments) as a share of annual household net disposable income. Income is defined as the sum of direct income and social transfers, less taxes and social insurance. Direct income includes employee income, gross cash benefits or losses from self-employment, rental income, pension income, interest and dividend payments. The MRTI is expressed as a percentage with values ranging from 0.45 per cent, indicating that some households in our sample spend less than 1 per cent of their annual net disposable income on mortgage repayments while others spend substantially more.[16] To get a better idea of the proportion of households facing high mortgage burdens, we divide our sample of households into deciles ranked according to their MRTI, the results of which are shown in Table 1. In addition, we show the average income and the average mortgage repayment of each group.

In Table 1, the bottom decile shows that 10 per cent of households in our sample face a mortgage repayment burden of between 0.45 and 3.56 per cent of their annual household net disposable income. This group has average annual net household disposable income of almost €100,000 and an average annual mortgage repayment of €2,300. The 5th decile shows that 50 per cent of households have a mortgage repayment which absorbs up to 10.56 per cent of their annual income, while the top decile shows that 10 per cent of households face a mortgage repayment burden of about 30 per cent of their annual household net disposable income and higher.

[16] We use an MRTI cut-off point of 200 per cent above which observations are excluded as outliers. There are four such observations.

Table 1: *Distribution of Mortgage Repayment to Income Ratio (MRTI) by Household Deciles (Weighted Results)*

Decile	*MRTI Range %*	*Average Income €000*	*Average Mortgage Repayment €000*	*Number of Households*
Bottom	0.45-3.56	96.3	2.3	123
2nd	3.57-4.93	76.4	3.3	122
3rd	4.94-6.50	69.8	3.9	123
4th	6.51-8.08	70.1	5.2	122
5th	8.09-10.56	67.0	6.1	123
6th	10.57-13.43	69.6	8.4	122
7th	13.44-16.75	55.9	8.5	123
8th	16.76-21.96	60.9	11.7	122
9th	21.97-30.99	54.7	14.1	123
Top	31.00+	44.3	20.3	122
Total		65.9	8.6	1,225

In Table 2 we present summary statistics for key demographic and economic variables for households in our sample, and break them out according to the MRTIs. At this stage, we group our households into six different categories, with the first category capturing the 50 per cent of households with the lowest repayment burden in our sample (which, as shown in Table 1, ranges from 0.45 per cent to 10.56 per cent of net disposable income), and each of the next five categories capturing the remaining ordered deciles shown in Table 1.

The summary statistics in Table 2 show that heads of households tend to be younger in more highly leveraged households in our sample: for the 50 per cent of households facing the lowest mortgage repayment burden (of between 0.45 per cent and 10.56 per cent of their annual net disposable income), the average age of the head of household is 47 years as compared to an average age of 38 years for the 10 per cent of households facing the highest mortgage repayment burden (of more than about 30 per cent of average annual net disposable income). More highly leveraged households also tend to be more often headed by females, by more highly educated heads and based in urban locations, relative to households facing lower mortgage repayment burdens. One adult households (either with or without children) also seem more likely to fall into higher mortgage repayment burden categories relative to other household types, while the same is true of households where the head of household is either single or widowed/ divorced/separated.

Table 2: *Household Summary Statistics, According to Mortgage Repayment to Income (MRTI) Ratio (%)*

MRTI		*0.45 to 10.56*	*10.57 to 13.43*	*13.44 to 16.75*	*16.76 to 21.96*	*21.97 to 30.99*	*31.00+*	*Total*
Head of Household	Mean Age (Years)	47	41	43	39	37	38	43
	Percentage Male	68.1	71.9	63.0	71.1	61.0	54.2	66.1
	Percentage Urban	72.0	68.7	72.6	79.1	77.4	80.1	73.8
Marital Status (HoH)	Single	7.0	9.7	19.8	21.0	38.3	44.6	17.5
	Married	82.2	81.2	50.9	71.3	47.7	34.3	68.5
	Widowed/ Divorced/ Separated	10.8	9.1	29.3	7.7	14.1	21.1	14.0
Work Status (HoH)	Employed	81.6	90.8	87.4	92.6	85.5	88.1	85.6
	Unemployed/ Inactive	18.4	9.2	12.6	7.4	14.5	11.9	14.4
Education Status (HoH)	Lower	35.1	27.9	19.4	20.0	14.2	24.8	27.3
	Upper and Non-Degree	43.1	54.3	49.8	41.5	34.8	44.6	44.3
	3rd Level Degree and Higher	21.5	17.8	30.8	37.4	48.2	30.5	27.8
	Other	0.3	0.0	0.0	1.2	2.9	0.0	0.6
Household Composition	1 Adult, with or without children<18	6.0	4.8	9.6	7.2	26.6	39.3	12.0
	2 Adults, no child<18	13.2	20.9	19.8	24.3	18.5	27.5	18.0
	3+ Adults, no child<18	23.6	14.6	17.1	8.8	6.6	2.1	16.2
	2 Adults, 1-3 child<18	34.4	50.3	44.7	48.3	43.3	26.6	39.3
	Other households with child<18	22.9	9.4	8.9	11.4	5.0	4.5	14.6
Household Income	One Member Earns 50%+ of Total	32.2	40.9	34.3	48.8	51.5	58.7	39.8
N		613	122	123	122	123	122	1,225

Note: N = Number of households in sample. Results are weighted.

As a final exercise at this stage of our analysis, we examine the proportion of households in each MRTI category in which one household member's employment income (either self-employed or employee income) accounts for 50 per cent or higher of total household income (in gross terms). From the results,

which are shown in the final panel of Table 2, it is clear that income in households with higher mortgage repayment burdens tends to be more often reliant on one individual's employment income. For example, 32.2 per cent of households in the lowest MRTI category are heavily reliant on income from one household member, relative to 58.7 per cent of households in the most heavily burdened category.

In Table 3 we examine mortgage characteristics by MRTIs, using the same mortgage repayment groupings as in Table 2. In the top panel, we show the source of mortgage according to the MRTI ratio and find that a larger proportion of highly burdened households obtained their mortgage from a bank relative to households with lower mortgage repayment burdens, while a larger proportion of households with lower MRTIs obtained their mortgage from a building society. Information on the type of mortgage held by different types of households shows that a slightly higher proportion of highly burdened households opted for interest only mortgages and endowment mortgages than

Table 3: *Mortgage Characteristics, According to Mortgage Repayment to Income (MRTI) Ratio (%)*

MRTI		*0.45 to 10.56*	*10.57 to 13.43*	*13.44 to 16.75*	*16.76 to 21.96*	*21.97 to 30.99*	*31.00+*	*Total*
Source of Mortgage	Building Society	51.2	37.6	43.5	39.4	38.6	34.4	44.4
	Bank	35.2	48.7	47.8	57.2	52.6	55.3	44.4
	Other	13.6	13.7	8.7	3.4	8.8	10.3	11.2
Mortgage Type	Endowment	16.5	13.7	7.7	10.8	4.0	23.6	13.7
	Annuity	77.5	79.5	85.2	85.2	81.9	63.6	78.7
	Interest Only	3.8	6.2	3.4	2.2	4.2	6.6	4.2
	Don't Know	2.2	0.6	3.7	1.8	9.9	6.2	3.4
Interest Rate	Fixed	30.1	23.3	37.2	31.6	34.0	30.0	30.8
	Variable	69.8	76.4	61.3	66.8	65.9	68.8	68.6
	Don't Know	0.1	0.3	1.5	1.6	0.1	1.2	0.6
Year Mortgage Taken Out	1970s/1980s	22.3	4.3	1.1	2.5	0.0	2.8	11.1
	1990s	53.8	29.6	32.3	14.1	11.5	13.5	35.5
	2000s	23.9	66.1	66.6	83.4	88.5	83.7	53.4
Mortgage Term	0-20 years	55.9	51.2	54.2	33.4	24.6	29.3	46.8
	21-30 years	40.3	46.9	41.6	54.1	57.2	64.6	46.8
	31-40 years	3.8	1.9	4.2	12.5	18.1	6.1	6.4
N		613	122	123	122	123	122	1,225*

Notes: N = Number of households in sample. Results are weighted.
* The total sample size is 1,223 for the panel "Source of Mortgage" since two respondents did not answer the question on mortgage provider.

those with the lowest MRTIs, while there is not much variation in the interest rate type (fixed versus variable) across the different household categories. The last two panels in the table show the year that the mortgage was taken out and the term of the mortgage. It is clear that more highly burdened households tend to have taken their mortgages out in recent years (particularly in the 2000s) and they also tended to opt for longer mortgage terms than households with relatively lower MRTI ratios.

In summary, the analysis in this section shows that the mortgage repayment burden varies significantly across households in our sample. While high repayment burdens can be the result of several factors, it is clear that many of the households in this position in our sample took their mortgages out in recent years, when house prices were at or near a peak.[17] They also opted more often for long mortgage terms and for variable rate mortgages, which makes these households particularly susceptible to interest rate shocks. Furthermore, a relatively high proportion of heavily burdened households in our sample are in households where the income of one individual accounts for over 50 per cent of total household income. This makes these households particularly vulnerable to unemployment shocks.

4.1 *Econometric Results*

In this section we use regression analysis to summarise the relationship between the demographic, socioeconomic and mortgage characteristics in our sample and the MRTI ratio. In Table 4 we present OLS regression results where the log of our MRTI ratio is the dependent variable and independent variables include dummies representing characteristics of the head of household such as gender, employment status, marital status and education level, as well as continuous variables such as age, age squared and the log of household annual net disposable income.[18] We also include a dummy variable capturing households based in an urban location and dummy variables representing various mortgage characteristics such as the mortgage source and the year that the mortgage was taken out. Omitted categories for dummy variables are detailed underneath the table.

In terms of the variables relating to head of household characteristics, the only variable that is significant is the dummy for third level education. Since the omitted category here is individuals with lower second level education or less, the coefficient on the third level education dummy suggests that the MRTI ratio in households where the head of household has a third level

[17] High MRTI ratios could, for example, be the result of a household having experienced a negative income shock in the period since the mortgage was taken out.
[18] We use a log-log specification for ease of interpretation.

Table 4: *OLS Regression Results (Dependent Variable: Log of MRTI Ratio) (Weighted Results)*

Independent Variable	*Coefficient*	*Standard Error*
Constant	9.33	0.908
Male	–0.04	0.059
Age	0.01	0.025
$(Age)^2$	0.00	0.000
Employed	0.11	0.079
Married‡	–0.05	0.052
Divorced‡	–0.04	0.089
Upper 2nd Education†	0.07	0.067
3rd Level Education†	0.25*	0.078
Log Income	–0.73*	0.053
Urban	0.15*	0.061
Bank§	0.38*	0.095
Building Society§	0.34*	0.102
Year 2000	0.79*	0.053
N = 1,223		
Adj. $R^2 = 0.49$		

Omitted Categories: ‡Single; †Lower 2nd Education or Less; §Other Mortgage Source.
Note: *Significant at 1 per cent level. Results are weighted.

education tends to be about 25 per cent higher than an equivalent household where the head of household has a lower second level education or less. The income variable is significant at the 1 per cent level and suggests that higher income leads to a lower MRTI ratio, all else equal. The coefficient on the dummy variable 'urban', which captures households based in an urban relative to a rural location, is significant at the 1 per cent level and suggests that MRTI ratios of households in urban locations tend to be about 15 per cent higher than those of households in rural locations, holding everything else constant.

Turning to the variables representing mortgage characteristics, the first set of dummies captures the source of the mortgage. Specifically, the dummy variable 'bank' is equal to one for those households that obtained their mortgage from a bank, and zero otherwise. The dummy variable 'building society' equals one if the household obtained its mortgage from a building society, and zero otherwise. The omitted category here is 'other mortgage source' and includes households that obtained their mortgage from a local authority, an insurance company, a housing finance agency, or some other source. The results suggest that households that obtained their mortgage from either a bank or a building society are more likely to have a higher MRTI ratio

than households that obtained their mortgage from some other source. Finally, the variable 'year 2000' is a dummy variable equal to one if the household took out its mortgage at some point since 2000. The coefficient on this variable is significant and suggests that households that took out their mortgage since 2000 tend to have a MRTI ratio which is over 75 per cent higher than households that took out their mortgage at some point prior to 2000, all else equal.

4.2 *Unemployment Scenario*

Figure 6 illustrates the acute rise in Irish unemployment rates since 2007. Such a sharp increase in the numbers of those jobless within the economy, given the relatively young vintage of many Irish mortgages, suggests that an increasing number of Irish households are likely to experience distress in coping with mortgage repayments. This is supported by certain information available at an aggregate level. For example, Moody's index of Residential Mortgage Backed Securities for Ireland shows that in January 2010 the rate of mortgages more than 90 days in arrears rose to 3.3 per cent – the first time the rate has been above 3 per cent since the agency began monitoring the area in 2004. Additionally, in March of 2010, the Irish Financial Regulator reported that 28,603 mortgage accounts or 3.6 per cent of the country's total mortgages were in arrears for more than three months at the end of 2009. Therefore, in this section, we examine the implications for the MRTI distribution in 2007 of the change in unemployment between 2007 and 2009.

To simulate the change in unemployment, we first identify, from the *SILC*, for all heads of households who are employed, the sector of their employment. Of the 1,225 households, 1,011 households had a head of household in employment. Second, we identify the sectors of the economy in which employment levels fell between 2007 and 2009. To do this, we refer to the Central Statistics Office (CSO) *Quarterly National Household Survey (QNHS).*[19] For those sectors that registered a fall in employment levels according to the *QNHS*, we report the percentage decrease in the column labelled "Percentage Decrease 2007-2009" in Table 5. As can be seen, the sector which reported the largest fall in employment levels between 2007 and 2009 is *construction* with nearly a 40 per cent fall in employment registered. *Industry*, with a decline of 13 per cent, was the next most affected sector.

Having now determined what the total employment levels in the different sectors should be for 2009, we have to reduce employment levels in our sample by the required amount. In doing this we randomly choose households. So, for

[19] Tables 2A and 2B available online at http://www.cso.ie/qnhs/calendar-quarters-qnhs.htm.

Table 5: *Change in Employment by Sector for Head of Household*

Sector	*% Decrease 2007-2009*
Agriculture, Forestry and Fishing	–11.2
Industry	–13.3
Construction	–39.3
Wholesale/Retail	–8.2
Transportation/Communication	
Hotels and Restaurants	–9.4
Financial Intermediation/Professional	–3.0
Public Administration	
Education	
Health	
Other	–6.5

example, in the case of construction we have to "make" 38 heads of households redundant. Once these households have been selected, the remaining issue is the extent to which household disposable income, for these households, should be reduced. We pick reductions of 50 and 75 per cent. The 50 per cent figure is arrived at by comparing average household disposable income in all mortgaged households in our sample for those with a head of household in employment with those where the head of household is unemployed. The second more extreme reduction is motivated by an examination of OECD figures on replacement rates for Ireland.[20] In 2007, these rates, in certain cases, were as low as about 25 per cent.

The implications of the unemployment scenario for the MRTI ratio are summarised in Table 6. Under both scenarios, there is a sizable increase in the number of people now in the top decile of the MRTI range – in scenario 1 (where income has been reduced by 50 per cent for newly unemployed households), the number of households in this, the most distressed range, has increased by almost 12 per cent. In the more extreme scenario 2, where income is down 75 per cent, the number of households is up by almost 25 per cent. This is quite worrying, particularly, when it is combined with the information in the final column. This reports the percentage of households, in each MRTI, who were unable to pay the mortgage at some point in the previous 12 months i.e. *a mortgage arrears rate*.[21] Clearly, as one would expect, at the highest rate

[20] Replacement rates are defined as the ratio of out-of-work disposable income to in-work income.

[21] This arrears rate was determined from the following question in the *SILC*: "In the last 12 months, did it happen that the household was unable to pay rent or to make a mortgage repayment for the main dwelling on time, due to financial difficulties?".

of the MRTI, the arrears rate is significantly larger than for most of the other ranges of the ratio. At over 8 per cent, it is more than twice the rate in some other cases. Given the sizeable increase in unemployment between 2007 and 2009, therefore, considerably more households are now in danger of going into arrears on mortgage payments. It is important to note that the arrears rate corresponds to the baseline distribution of the MRTI ratio and has not been adjusted to reflect changes under the scenarios.

Table 6: *Scenario Results for Unemployment Shock*

MRTI Range	*Baseline Number*	*Scenario 1 % Change*	*Scenario 2 % Change*	*Arrears Rate %*
0.45 – 10.56	613	–2.2	–2.9	2.2
10.57 – 13.43	122	–2.1	–2.1	5.9
13.44 – 16.75	123	0.2	–3.6	2.7
16.76 – 21.96	122	0.2	–4.1	1.1
21.97 – 30.99	123	1.1	0.3	4.8
31.00+	122	11.5	23.9	8.3

4.3 *Interest Rate Scenario*

As a final exercise, we examine the sensitivity of the MRTI ratio to changes in the mortgage interest rate. Table 3 reveals that, on average, almost 70 per cent of Irish households have variable rate mortgages. While this figure is quite similar to that in the United Kingdom, it is quite high within the Euro Area. A recent ECB paper, Drudi *et al.* (2009), shows that, on average, 43 per cent of new loans within the Euro Area are variable rate compared with 67 per cent in the case of Ireland. Additionally, the mortgage market in countries such as France, Germany, the Netherlands and the United States are all characterised as being, mainly, financed by fixed rate mortgages.[22] Thus, Irish households, in terms of their mortgage repayments, are, by international comparisons, particularly sensitive to interest rate movements. This situation is compounded by the fact that, as noted already, a relatively large proportion of Irish mortgages have been taken out at historically high house price levels.

We conduct a scenario exercise where we examine the distributional implications for the MRTI ratio of a 1.5 percentage point increase and decrease in the 2007 variable mortgage rate faced by households. In order to

[22] The relatively high proportion of households in the UK on variable rate mortgages prompted the 2004 Miles Report, which argued that, if the mortgage market in the UK "worked better" there was good reason to believe that more longer-term fixed-rate borrowing would emerge.

gauge the impact of interest rate changes, we have to calculate the mortgage repayment with the following standard annuity formula:

$$P_t = M_t \left(\frac{1 - (1 + R_t)^{-\tau}}{R_t} \right) \quad (1)$$

where: P_t is the monthly repayment, M_t is the actual mortgage level, R_t is the variable interest rate and τ is the duration of the mortgage.

The actual rate R_t in Equation 1 is replaced with the two alternative scenario rates and the associated repayment levels are calculated. The implications for the MRTI are summarised in Table 7. The results illustrate the sensitivity of households' affordability to interest rate changes. An increase in the variable mortgage rate by 1.5 percentage points (Scenario 3) results in a 31 per cent increase in the number of households in the top decile range. The bulk of households that move into this highest decile took their mortgages out in the 2000s and have heads of households that are, on average, younger than households in lower MRTI categories.[23] On the other hand, a reduction in the variable mortgage rate of 1.5 percentage points (Scenario 4) results in a 30 per cent drop in the number of households in the highest MRTI category. As with the unemployment scenario, the arrears rates reported in the final column refer to those of the baseline distribution.

Table 7: *Scenario Results for Interest Rate Shock*

MRTI Range	*Baseline Number*	*Scenario 3 % Change*	*Scenario 4 % Change*	*Arrears Rate %*
0.45 – 10.56	430	–8.4	10.7	2.2
10.57 – 13.43	74	–2.7	13.5	5.9
13.44 – 16.75	84	–13.1	–13.1	2.7
16.76 – 21.96	81	13.6	–1.2	1.1
21.97 – 30.99	79	13.9	–22.8	4.8
31.00+	87	31	–29.9	8.3

Note: Baseline numbers differ from Table 6 since here we restrict our sample to households on a variable mortgage interest rate.

[23] It should be noted however, that since the number of households moving into this higher MRTI category is quite small, the descriptive statistics for this group may not be representative.

V CONCLUSIONS

As of 2009, the Irish mortgage market is in a particularly precarious position. At the height of a pronounced property boom, a substantial volume of mortgages were extended at price levels that have subsequently proven to have been considerably overvalued. Consequently, a large number of Irish households are now very highly leveraged, while property prices are falling by over 15 per cent per annum.[24] This situation has been exacerbated by the rapid downturn in Irish economic activity post-2007, with unemployment, in particular, soaring from 4.5 to 12 per cent in just two years. As a result, there is a growing realisation that many Irish households are facing difficulties in meeting their mortgage repayments.

In this paper we present the results of an in-depth analysis of mortgage information for Irish households contained within the EU-wide *Survey on Income and Living Conditions (SILC)*. Combining data on household disposable income and mortgage repayments, we calculate a Mortgage Repayment to Income (MRTI) ratio and examine its distribution across both household and mortgage characteristics. This provides a telling cross-sectional snapshot of mortgage affordability amongst Irish households. In particular, our summary statistics show that more highly burdened households tend to have heads of household who are younger, more often female and more highly educated than heads in households with lower mortgage burdens. More heavily burdened households also more often tend to be based in urban locations, have taken their mortgage out in recent years and face a longer mortgage term than households with a lower mortgage burden. In an unemployment scenario, we attempt to approximate the reality of the rapid increase of Irish unemployment between 2007 and 2009 vis-à-vis the distribution of the MRTI, while an interest rate scenario illustrates the vulnerability of household affordability to variable rate changes.

The *SILC* dataset is clearly a rich source of material in addressing the Irish mortgage market and subsequent releases of data are set to contain additional information on subjects of particular interest such as credit commitment arrears and financial distress. This paves the way for many interesting questions to be addressed in future research.

[24] The most recent data suggests a 19 per cent decline between the second quarter of 2008 and the second quarter of 2009 in new house prices.

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